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FAIRCHILD
A Schlumberger Company

IRF140-143/IRF540-543 T-39-13
N-Channel Power MOSFETs, 27 A, 60-100 V

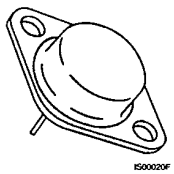
Power And Discrete Division

Description

These devices are n-channel, enhancement mode, power MOSFETs designed especially for high power, high speed applications, such as switching power supplies, UPS, AC and DC motor controls, relay and solenoid drivers and high energy pulse circuits.

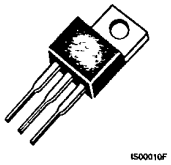
- **Low $R_{DS(on)}$**
- **V_{GS} Rated at ±20 V**
- **Silicon Gate for Fast Switching Speeds**
- **I_{DSS}, $V_{DS(on)}$, Specified at Elevated Temperature**
- **Rugged**
- **Low Drive Requirements**
- **Ease of Paralleling**

TO-204AE



IRF140
IRF141
IRF142
IRF143

TO-220AB



IRF540
IRF541
IRF542
IRF543

Product Summary

Part Number	V_{DSS}	$R_{DS\ (on)}$	I_D at T_C = 25°C	I_D at T_C = 100°C	Case Style
IRF140	100 V	0.085 Ω	27 A	17 A	TO-204AE
IRF141	60 V	0.085 Ω	27 A	17 A	
IRF142	100 V	0.11 Ω	24 A	15 A	
IRF143	60 V	0.11 Ω	24 A	15 A	
IRF540	100 V	0.085 Ω	27 A	17 A	TO-220AB
IRF541	60 V	0.085 Ω	27 A	17 A	
IRF542	100 V	0.11 Ω	24 A	15 A	
IRF543	60 V	0.11 Ω	24 A	15 A	

Notes
For information concerning connection diagram and package outline, refer to Section 7.

IRF140-143/IRF540-543

T-39-13

Maximum Ratings

Symbol	Characteristic	Rating IRF140/142 IRF540/542	Rating IRF141/143 IRF541/543	Unit
V_{DSS}	Drain to Source Voltage[1]	100	60	V
V_{DGR}	Drain to Gate Voltage[1] R_{GS} = 20 kΩ	100	60	V
V_{GS}	Gate to Source Voltage	±20	±20	V
T_J, T_{stg}	Operating Junction and Storage Temperatures	−55 to +150	−55 to +150	°C
T_L	Maximum Lead Temperature for Soldering Purposes, 1/8" From Case for 5 s	275	275	°C

Maximum Thermal Characteristics

		IRF140-143	IRF540-543	
$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.0	1.0	°C/W
P_D	Total Power Dissipation at T_C = 25°C	125	125	W
I_{DM}	Pulsed Drain Current[2]	108	108	A

Electrical Characteristics (T_C = 25°C unless otherwise noted)

Symbol	Characteristic	Min	Max	Unit	Test Conditions
Off Characteristics					
$V_{(BR)DSS}$	Drain Source Breakdown Voltage[1]			V	V_{GS} = 0 V, I_D = 250 μA
	IRF140/142/540/542	100			
	IRF141/143/541/543	60			
I_{DSS}	Zero Gate Voltage Drain Current		250	μA	V_{DS} = Rated V_{DSS}, V_{GS} = 0 V
			1000	μA	V_{DS} = 0.8 x Rated V_{DSS}, V_{GS} = 0 V, T_C = 125°C
I_{GSS}	Gate-Body Leakage Current IRF140-143		±100	nA	V_{GS} = ±20 V, V_{DS} = 0 V
	IRF540-543		±500		
On Characteristics					
$V_{GS(th)}$	Gate Threshold Voltage	2.0	4.0	V	I_D = 250 μA, V_{DS} = V_{GS}
$R_{DS(on)}$	Static Drain-Source On-Resistance[2]			Ω	V_{GS} = 10 V, I_D = 15 A
	IRF140/141/540/541		0.085		
	IRF142/143/542/543		0.11		
g_{fs}	Forward Transconductance	6.0		S (℧)	V_{DS} = 10 V, I_D = 15 A

Electrical Characteristics (Cont.) (T_C = 25°C unless otherwise noted)

Symbol	Characteristic	Min	Max	Unit	Test Conditions
Dynamic Characteristics					
C_{iss}	Input Capacitance		1600	pF	V_{DS} = 25 V, V_{GS} = 0 V
C_{oss}	Output Capacitance		800	pF	f = 1.0 MHz
C_{rss}	Reverse Transfer Capacitance		300	pF	
Switching Characteristics (T_C = 25°C, *Figures 1, 2,*)[3]					
$t_{d(on)}$	Turn-On Delay Time		30	ns	V_{DD} = 45 V, I_D = 15 A
t_r	Rise Time		60	ns	V_{GS} = 10 V, R_{GEN} = 4.7 Ω
$t_{d(off)}$	Turn-Off Delay Time		80	ns	R_{GS} = 4.7 Ω
t_f	Fall Time		30	ns	
$t_{d(on)}$	Turn-On Delay Time		60	ns	V_{DD} = 25 V, I_D = 15 A
t_r	Rise Time		450	ns	V_{GS} = 10 V, R_{GEN} = 50 Ω
$t_{d(off)}$	Turn-Off Delay Time		150	ns	R_{GS} = 50 Ω
t_f	Fall Time		200	ns	
Q_g	Total Gate Charge		60	nC	V_{GS} = 10 V, I_D = 34 A V_{DD} = 35 V

Symbol	Characteristic	Typ	Max	Unit	Test Conditions
Source-Drain Diode Characteristics					
V_{SD}	Diode Forward Voltage				
	IRF140/141/540/541	2.0	2.5	V	I_S = 27 A; V_{GS} = 0 V
	IRF142/143/542/543	2.0	2.3	V	I_S = 24 A; V_{GS} = 0 V
t_{rr}	Reverse Recovery Time	300		ns	I_S = 4.0 A; dI_S/dt = 25 A/μS

Notes
1. T_J = +25°C to +150°C
2. Pulse width limited by T_J
3. Switching time measurements performed on LEM TR-58 test equipment.

Typical Electrical Characteristics

Figure 1 Switching Test Circuit

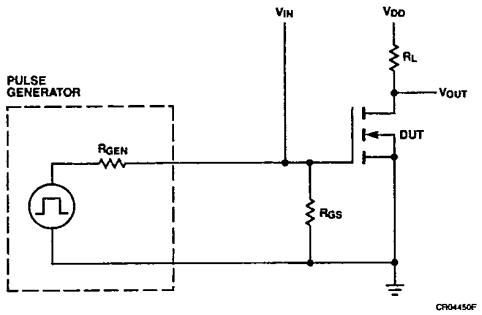
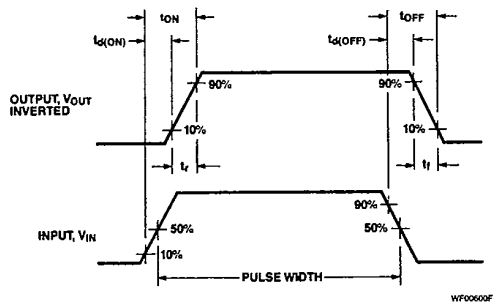


Figure 2 Switching Waveforms



Typical Performance Curves

Figure 3 Output Characteristics

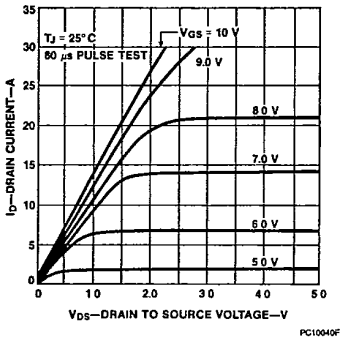


Figure 4 Static Drain to Source Resistance vs Drain Current

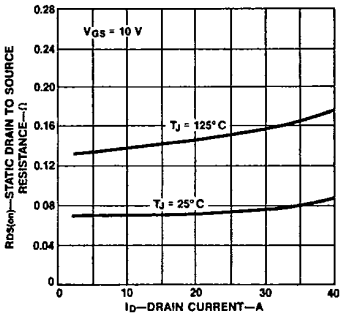


Figure 5 Transfer Characteristics

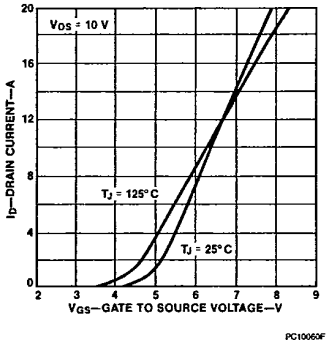
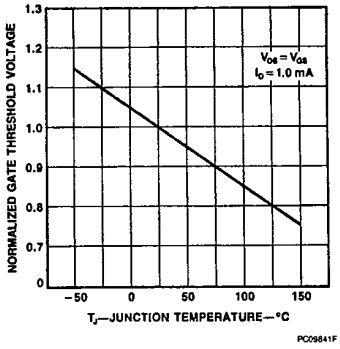


Figure 6 Temperature Variation of Gate to Source Threshold Voltage



Typical Performance Curves (Cont.)

Figure 7 Capacitance vs Drain to Source Voltage

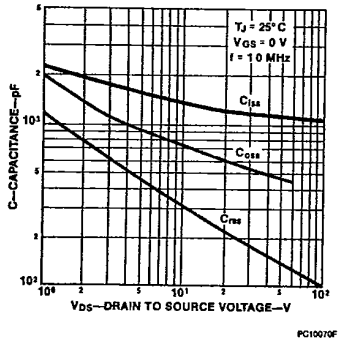


Figure 8 Gate to Source Voltage vs Total Gate Charge

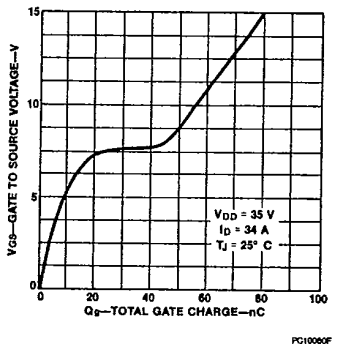


Figure 9 Forward Biased Safe Operating Area

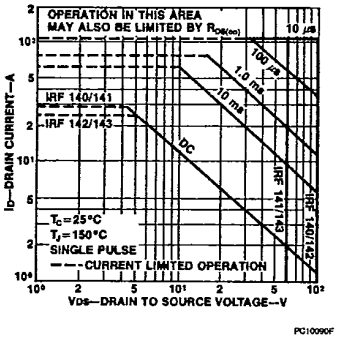


Figure 10 Transient Thermal Resistance vs Time